

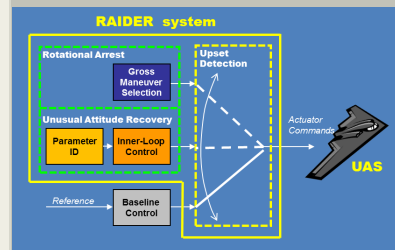
Development and Flight Testing of RAIDER: An Automated Upset Recovery System, Phase II

Completed Technology Project (2016 - 2018)



Project Introduction

UAS have the potential to offer great economic and operational advantages, but realizing this potential will require greater operational flexibility for UAS in the National Airspace. New technologies that enable beyond visual line of sight operations and that allow one operator to control multiple vehicles will expand the range of missions that can be accomplished and reduce operating costs. Automated upset recovery technology will reduce reliance on a human operator to mitigate hazards posed by Loss of Control (LOC) due to upset, leading to greater operational freedom. This technology is critical because LOC due to upset is one of the main causes of accidents in manned aircraft and is already emerging as an important causal factor in UAS accidents. LOC of an UAS operated at low altitude poses a hazard to people and property on the ground and is a barrier to relaxing operational restrictions. The Phase I research has developed a recovery system that replaces the perception, cognition, and decision making of a skilled operator with a two-stage automated recovery architecture and an innovative upset detection system. The decision about when to activate each stage of a recovery is difficult to make at design-time, so the upset detection system employs a novel statistical testing framework that combines at run-time numerous pieces of data including vehicle attitude, rotational rate, and controller performance to answer the question: Has an upset occurred? During Phase I, the recovery system was evaluated in a high quality simulation of a small fixed-wing vehicle. All hardware needed for flight testing was obtained, and systems integration work was performed. The proposed Phase II effort will focus on flight testing of the recovery system, including tests with multiple vehicle designs. The Phase II team includes a flight testing and commercialization partner with a track record of safe, legal, and effective UAS inspection operations in support of commercial customers.



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Table of Contents

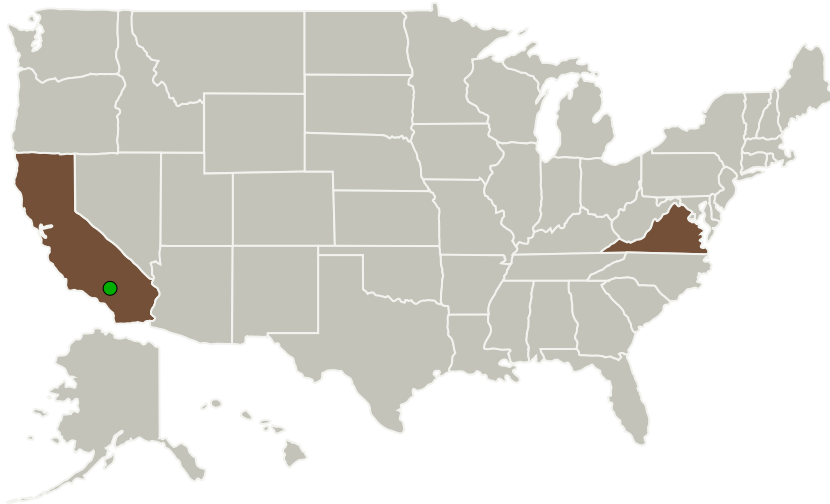
Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Technology Areas	3
Target Destinations	3

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Barron Associates, Inc.	Lead Organization	Industry	Charlottesville, Virginia
● Armstrong Flight Research Center (AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations

California	Virginia
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Project Transitions

▶ **April 2016:** Project Start

✓ **June 2018:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139591>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Barron Associates, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

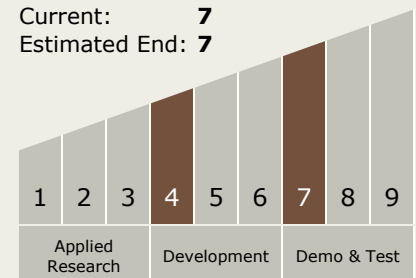
Carlos Torrez

Principal Investigator:

Richard Adams

Technology Maturity (TRL)

Start: 4
Current: 7
Estimated End: 7

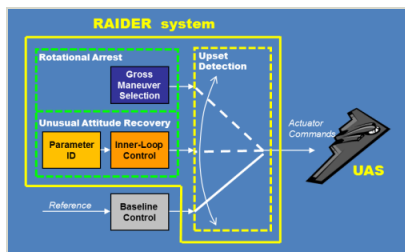


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Images



Briefing Chart Image

Development and Flight Testing of RAIDER: an Automated Upset Recovery System, Phase II
(<https://techport.nasa.gov/image/127253>)

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.8 Ground and Flight Test Technologies

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System